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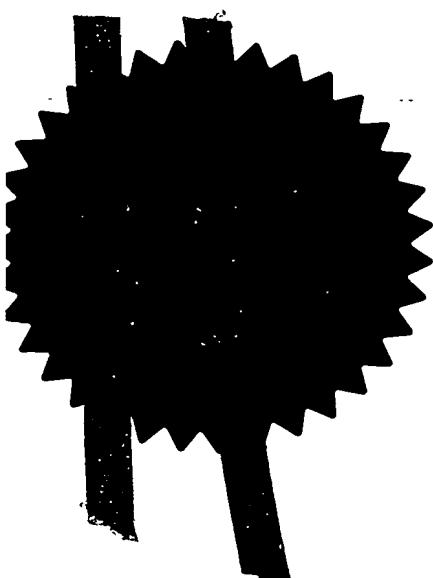
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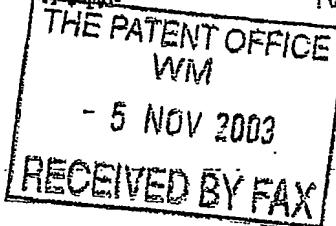
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DM/BDW/ED/P13068GB

## 2. Patent application number

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0325820.9

3. Full name, address and postcode of the or of  
each applicant (underline all surnames)

Andrew Clayton  
92 Strathern Road  
Broughty Ferry  
Dundee DD5 1JS

Patents ADP number (if you know it)

3988110002

If the applicant is a corporate body, give the  
country/state of its incorporation

## 4. Title of the invention

Filter Apparatus

## 5. Name of your agent (if you have one)

Cruikshank & Fairweather  
19 Royal Exchange Square  
Glasgow G1 3AE

"Address for service" in the United Kingdom  
to which all correspondence should be sent  
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547002

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FILTER APPARATUSFIELD OF INVENTION

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The present invention relates to filtration apparatus, and in particular, though not exclusively, to a filter apparatus for use, for example, in filtering of cooking oil or fat or "shortening" from a cooking apparatus, such as a deep fat fryer. Such cooking apparatus can be found in commercial premises such as fast food outlets, take-aways, or the like. The invention also relates to a filter means and a support means for use in such a filter apparatus, to a cooking apparatus including such a filter apparatus, and to use of the filter apparatus.

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BACKGROUND TO INVENTION

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Filtration is a large technical field, and filters for oils and fats exist. The Applicant has, however, identified a particular need for an improved filter apparatus for oils and fats, particularly in cooking apparatus using oils or fats, e.g. in food outlets such as fast food outlets or factory premises. Such cooking apparatus may comprise a deep fat fryer.

25

There are particular problems and desires in the use of industrial cooking oils and fats, e.g.:

difficulty of disposal - even though typically 12% of volume is absorbed, in use;

existence and build-up of harmful "free radicals";

a desire to extend the lifetime of the oil/fat;

5 a desire to keep the oil/fat relatively clean, dirty oil being more difficult to cook with;

a desire for in-line filtering of oils/fats, allowing recycling thereof.

The applicant has identified several issues that 10 have to be addressed, in providing an improved filter apparatus, e.g.:

(1) Fats in particular have to be kept above approximately 30°C to be liquid. In most cases a frying temperature is in the range of 160°C to 190°C.

15 It is therefore desirable to provide a low cost filter apparatus capable of dealing with solid and liquid fats at both normal room temperature and at very high temperatures.

(2) Fats particularly are very viscous even at high temperature so the viscous drag imposed on a filter is high. A large surface area is therefore required if suction pressure requirements of the pump which pulls fat through the filter are to be kept low.

Pumps generally do not develop high suction conditions.

(3) Cleaning is critical. A filter is desirably readily cleanable and changeable and retains all debris, at least during changing. Large particles (above 1000 microns) cannot normally be absorbed by a filter media such as paper (the pore sizes are too small) so are desirably retained in some form of basket or cup.

10 (4) As oil and fats are essentially low cost commodities, the filter ought not to retain excessive oil or fat when disposed of.

(5) A filter apparatus ought not to be too heavy to handle easily, and portable units are desirably simple and inherently safe to use.

15 Classic filter design addressing these issues can be found on many car, truck and lubricating oil systems. These are cartridge filters and consist of a paper (or similar) pleated filter element held within a metal or plastic can. The can holds the large particles that cannot be absorbed by the paper element and the cartridge filter is disposed of on an infrequent basis.

20 Known filters use sealing elements to separate a suction side from a discharge. This means that the seal

needs to be compressed in some way and the filter apparatus becomes costly.

In a similar vein filter bags (as found on vacuum cleaners) have been developed, but again require sealing elements to separate suction from discharge.

It is an object of at least one embodiment of at least one aspect of the present invention to obviate or mitigate one or more of the problems or disadvantages in the art.

10 It is a further object of at least one embodiment of at least one aspect of the present invention to seek to fill one or more of the needs in the art mentioned hereinbefore.

15 It is a yet further object of at least one embodiment of at least one aspect of the present invention to seek to provide a low cost, easily emptiable, easily replaceable filter, which advantageously retains both large and small filtered particles.

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#### SUMMARY OF INVENTION

These and other objects of the present invention are addressed by the general solution of providing a filter device or apparatus, wherein, in use, a seal is formed

between a filter means and a filter means support by a liquid being filtered.

These and other objects of the present invention are alternatively addressed by the general solution of 5 providing a filter device or apparatus having a cup means for receiving, in use, matter from a liquid being filtered.

According to a first aspect of the present invention there is provided a liquid filter apparatus, such as a 10 cooking oil and/or fat filter apparatus, the apparatus comprising:

a filter means;  
at least one filter support means, wherein, in use, at least one seal is formed between the filter means and 15 the filter support means by a liquid being filtered.

By such an arrangement a viscous nature of the liquid is used to provide the at least one seal between a suction side and a discharge side of the filter means. The filter apparatus can therefore conveniently be termed 20 "self sealing".

The at least one seal may be provided by virtue of the liquid adhering to the filter support means and/or filter means and providing the at least one seal through viscous tension.

The filter apparatus may further comprise a cup for receiving matter from a liquid being filtered, in use.

According to a second aspect of the present invention there is provided a liquid filter apparatus, such as a cooking oil and/or fat filter apparatus, the apparatus comprising:

a filter means; and  
a cup for receiving matter from a liquid being filtered, in use.

10 Most preferably the filter means and cup comprise a single cup and filter body.

Preferably the single cup and filter body comprise a sheet form member, e.g. a flat sheet form member which may be formed or folded so as to form the cup. By such 15 an arrangement there is provided a single body which filters and retains large particles via the cup and filters and retains small or fine particles via the filter means.

20 Preferably the filter means may be made from a cellulose fabric, e.g. rayon or viscose. Alternatively, the filter means may be made from paper, polyester, PTFE or the like.

A suction side surface of the cup may comprise an annular receiving space.

There may further be provided a filter support means.

The filter support means may comprise a substantially rigid body having an inner surface which at 5 least in part closely fits with discharge side surface of the filter means.

The filter support means may be made from a food grade metal or a food grade high temperature resistant plastic.

10 Preferably the filter apparatus comprises inlet means for delivery of unfiltered liquid to the filter means, and outlet means for removal of filtered liquid from the filter means.

15 In a first embodiment the inlet means is above the filter means, and the outlet means is below the filter means.

In a second embodiment the inlet means is above the filter means, and the outlet means is above the filter means.

20 Beneficially the single cup and filter body may have a side cross-section in the shape of a "W". Alternatively, the filter means may have a side cross-section in the shape of a "V".

Beneficially also the filter support means may have a side cross-section in the shape of a "W". Alternatively, the filter support means may have a side cross-section in the shape of a "V".

5 The single cup and filter body may comprise a first frusto-conical portion and a second frusto-conical portion, advantageously, the first frusto-conical portion being provided within the first frusto-conical portion, the second frusto-conical portion being inverted relative to the first frusto-conical portion, a narrow end of the first frusto-conical portion being integral with a wide end of the second frusto-conical portion.

10 Preferably the filter support means provides means to transport filtered liquid from a discharge side of the filter means to the outlet means.

15 In the first embodiment the transfer means may comprise a plurality of apertures, e.g. holes, slots or the like, in the filter support means. By such arrangement, in use, filtered liquid may pass through the filter support means.

20 In the second embodiment the transport means may comprise a plurality of channels provided or formed on a surface of the filter support means. By such

arrangement, in use, filtered liquid may pass along the filter support means.

Advantageously, the filter apparatus provides means for detachably attaching the filter means thereto. This 5 facilitates emptying, cleaning or changing of the filter means.

Preferably the detachable attachment means comprises means for releasably connecting the filter support means to the inlet means and outlet means.

10 Preferably the releasable connection means comprises a quick release coupling such as a bayonet fitting.

Preferably the inlet means includes a rotary coupling.

15 Preferably also, the outlet means includes a further rotary coupling.

According to a third aspect of the present invention there is provided a filter means for use in a filter apparatus according to the first or second aspects of the present invention.

20 According to a fourth aspect of the present invention there is provided a filter support means for use in a filter apparatus according to the second aspect of the present invention.

According to a fifth aspect of the present invention there is provided a cooking apparatus comprising a filter apparatus according to either of the first or second aspects of the present invention.

5 . The cooking apparatus may comprise a commercial cooking apparatus, adapted for use in a food outlet such as a restaurant or fast food outlet or take-way premises. Alternatively the cooking apparatus may be adapted for use in a factory setting.

10 The cooking apparatus may comprise a frying machine such as a deep fat fryer.

The cooking apparatus may be gas or electric powered.

15 BRIEF DESCRIPTION OF DRAWINGS

Embodiments of the present invention will now be described by way of example only, and with reference to the accompanying drawings, which are:

Figure 1 a schematic view of a first cooking apparatus providing a filter apparatus according to a first embodiment of the present invention;

5 Figure 2 a schematic side view of the filter apparatus of Figure 1;

Figure 3 a perspective view from one side and above of a filter means of the filter apparatus of Figure 1;

10 Figure 4 a planar view of the filter means of Figure 3 prior to forming;

Figure 5 a perspective view of part of a second cooking apparatus providing a filter apparatus according to a second embodiment of the present invention;

15 Figure 6 a perspective view to an enlarged scale of the filter apparatus of Figure 5, in use;

Figure 7(a) a further perspective view to an enlarged scale of the filter apparatus of Figure 5, in use, shown cut-away and with the filter means thereof removed;

20 Figure 7(b) a sectional view taken along line A - A of the filter apparatus of Figure 7a;

Figure 8 a sectional view taken along line B - B of the filter apparatus of Figure 6;

5 Figure 9 a schematic side view of an encircled portion of the filter apparatus of Figures 6 and 8 to an enlarged scale.

Figure 10 an alternative perspective view of the cooking apparatus of Figure 5; and

10 Figure 11 a perspective view from one side and to an enlarged scale of rotary couplers of the filter apparatus of Figure 5.

DETAILED DESCRIPTION OF DRAWINGS

Referring firstly to Figure 1, there is illustrated a cooking apparatus, generally designated 5 including a filter apparatus 10 according to a first embodiment of the present invention. The cooking apparatus 5 also comprises a deep fat fryer unit 15, an outlet 20 from the fryer unit 15 connected to an inlet 25 to the filter apparatus 10 by first pipework 30, and an outlet 35 from the filter apparatus 10 connected to an inlet 40 of the fryer unit 15 by second pipework 45. A pump 46 is provided within pipework 45.

The cooking apparatus 5 is particularly adapted for commercial use, e.g. in a fast food or take-away outlet.

However, the cooking apparatus 5 can be adapted for other uses, e.g. in a factory. The cooking apparatus 5 can typically be powered by gas or electricity.

Turning next to Figures 2 to 4, there is illustrated 5 the filter apparatus 10 of Figure 1 according to the first embodiment of the present invention. The filter apparatus 10 comprises: a liquid permeable filter means 100, and at least one filter support means 105, wherein, in use, seals 110a,110b are formed between the filter 10 means 100 and the filter support means 105 by a liquid 115 being filtered.

By such an arrangement a viscous nature of the liquid 115 is used to provide seals 110a,110b between a suction side 120 and a discharge side 125 of the filter 15 means 100. The filter apparatus 10 can therefore conveniently be termed "self sealing".

It is believed that the seals 110a,110b are provided, in use, by virtue of the liquid 115 adhering to the filter support means 105 and/or filter means 100, 20 thereby providing the seals 110a,110b through viscous tension.

The filter apparatus 10 further comprises a cup 130 for receiving matter from the liquid 115 being filtered, in use. The filter means 100 and cup 130 comprises a

single cup and filter body 135, the single cup and filter body 135 comprising a sheet form member 140, which is formed or folded so as to form the cup 130. A suction side surface 14 of the cup 130 provides an annular receiving space 145. By such an arrangement there is provided a single body 135 which filters and retains large particles in the cup 130 and filter and retains small or fine particles via the filter means 100.

The filter means 100 is typically made from a cellulose fabric, e.g. rayon or viscose. Alternatively, the filter means 100 can be made from paper, polyester, PTFE or the like. Rayon is typically any of various shiny textile fibres and fabrics made from cellulose. Rayon is typically produced by pressing whatever cellulose solution is used through very small holes and solidifying the resulting filaments. A common type is viscose, which consists of regenerated filaments of pure cellulose. Acetate and triacetate are kinds of rayon consisting of filaments of cellulose acetate and triacetate.

The filter support means 105 comprises a filter support body 150. The filter support body 150 comprises a substantially rigid body having an inner surface 155 which at least in part closely fits with a discharge side surface 160 of the filter means 100. The filter support

means 105 is typically made from food grade metal. Alternatively the filter support means 105 is made from a high temperature resistant plastic similarly suitable for food use.

5 The filter apparatus 10 comprises inlet 25 for delivery of unfiltered liquid to the filter means 100, and outlet 35 for removal of filtered liquid from the filter means 100.

10 In this first embodiment, the inlet 25 is above the filter means 100, and the outlet 35 is below the filter means 100. This provides for sideways removal and installation of the single cup and filter body 135 as will become apparent hereinafter.

15 The single cup and filter body 135 has a side cross-section in the shape of a "W". In a modification, however, the filter means 100 can have a side cross-section in the shape of a "V". The filter support body 150 has a side cross-section in the shape of a "W". Alternatively, in the modification the filter support body 150 can also have a side cross-section in the shape of a "V".

20 In this embodiment the single cup and filter body 135 comprises a first frusto-conical portion 165 and a second frusto-conical portion 170, the second frusto-

conical portion 170 being provided within the first frusto-conical 165, the second frusto-conical portion 175 being inverted relative to the first frusto-conical portion 165, a narrow end of the first frusto-conical portion 165 being integral with a wide end of the second frusto-conical portion 170.

The filter support body 150 provides means 175 to transport filtered liquid from a discharge side of the filter means 100 to the outlet 35.

10 In this first embodiment the transport means 175 comprises a plurality of apertures 180, e.g. holes, slots or the like, in the filter support body 150. By such arrangement, in use, filtered liquid 115 can pass through the filter support body 150.

15 The filter apparatus 10 provides means (not shown) for detachably attaching the filter means 100 thereto. This facilitates emptying, cleaning or changing of the filter means 100. The detachable attachment means comprises means (not shown) for releasably connecting the 20 filter support body 150 to the inlet 25 and outlet 35.

Referring again to Figure 2 to 4, the filter means 100 consists of a circular "cone within a cone" form. The "W" cross-section of the filter means 100 is formed by a "V" section which is rotated to form the "W".

In use, oil passes into the filter means 100 from inlet 25 and is directed into the "V" section. The geometry allows fat or oil to pass through the filter means 100 whilst retaining large debris in the "V".

5. Smaller or fine debris passes into the filter means 100 and is held by the fibre structure of the filter means 100. In this way both fine and large debris is held within the single body 135.

The properties of the fluid being viscous are used 10 to create seals 110a,110b between the filter support means 105, and the filter means 100. The geometry of the filter means 100 is such that the net suction force drawing oil through the filter media reinforces the seals 110a,110b. Clean or filtered oil 115 is drawn by suction 15 force down and through the outlet 35.

Means to increase a surface area of the filter means 100 could include pleating, multiple filter cones and different forms. It will be appreciated that different forms could be used such as a simple cup, but the "W" 20 section provides for ease of removal.

Referring particularly to Figure 2, a top part of each frusto-conical portion 165,170 contacts with a solid face, i.e. non-filtering element, in the filter support means 105. Below this face the filter means 100 is

supported by the filter support means 105 comprising ribs which allow liquid to pass through. The filter means 100 "sticks" to the solid face and seals through viscous tension. The solid support face therefore prevents oil 5 flowing through the filter material at this section.

Turning now to Figures 5 to 11, there is illustrated a filter apparatus 10' according to a second embodiment of the present invention, and which can also be used in the cooking apparatus 5 of Figure 1. The filter 10 apparatus 10' of the second embodiment is similar in many respects to the filter apparatus 10 of the first embodiment, like parts being denoted by like numerals, but suffixed with "'".

The filter apparatus 10' of the second embodiment 15 differs from the filter apparatus 10 of the first embodiment in the following respects.

In the second embodiment, the inlet 25' is above the filter means 100', and the outlet 35' is also above the filter means 100'. This provides for sideways and/or 20 downwards removal of the single cup and filter body 135' from the filter apparatus 10', and sideways and/or upwards installation of the single cup and filter body 135' on the filter apparatus 10'.

Further, in this second embodiment the transport means 175' comprises a plurality of longitudinally extending channels 180' provided on a surface 185' of the filter support body 150'. By such arrangement, in use, 5 filtered liquid 115' passes along the filter support body 150' to outlet 35', as shown by the arrows in Figure 6.

Also in this second embodiment the releasable connection means connecting the filter support means 105' to the inlet 25' and outlet 35' comprises a quick release 10 coupling 185' which in this example, comprises a bayonet type fitting. The quick release coupling 185' comprises a first point on the filter support means 105', which releasably engages with a second point on a lid 190', which carries to inlet 25' and outlet 35'. The filter support means 105' also has a handle 195' to assist in removal and installation thereof.

The inlet 25' includes a rotary coupling 190' and the outlet 35' comprises a further rotary coupling 195' (see Figure 10). The rotary couplings 190', 195' facilitate positioning of pipes into the frying pan (not shown).

It can also be seen from Figure 5 that the outlet 35 of the filter apparatus 10' is connected to a suction pump 46' driven by a motor 47', such that filtered liquid

is returned from the filter apparatus 10' to a fryer (not shown) via the pump 46'.

Figure 7(a) is a further perspective view to an enlarged scale of the filter apparatus of Figure 5, in use, shown cut away with the filter means thereof removed. With the filter means removed, the transport means 175' can be more clearly seen. The transport means 175' comprises the plurality of longitudinally extending channels 180' provided on the surface 185' of the filter support body 150'. These channels 180' can also be clearly seen in Figure 7(b) which is a sectional view taken along line A - A of the filter apparatus of Figure 7(a). Again the longitudinally extending channels 180' provided on the surface 185' of the filter support body 150' can be seen. By such an arrangement, in use, filtered liquid (not shown) passes along the filter support body 150' to the outlet 35' as shown by the arrows.

Referring to Figure 8, there is shown a sectional view taken along line B - B of the filter apparatus of Figure 6. This figure clearly shows the "W" section of filter means 100' resting on the filter support body 150'.

Referring now to Figure 9, there is shown a schematic side view of an encircled portion of the filter apparatus of Figures 6 and 8 to an enlarged scale. The filter means 100' forms a seal with the internal surface 5 185' by viscous tension due to the viscous nature of the liquid (not shown) which is being filtered through the filter means 100'. Below this sealing arrangement, the transport means 175' guides the filtered liquid (not shown) which is passed through the filter means 100' to 10 the outlet (not shown).

Referring now to Figure 10, there is shown an alternative perspective view of the cooking apparatus of Figure 5. This perspective view shows more clearly the inlet rotary coupling 190' and the outlet rotary coupling 15 195'. These rotary couplings facilitate the positioning of pipes on to the frying pan (not shown).

Figure 11 shows a cutaway perspective view of rotary coupling 195' attached to the outlet (not shown).

It will be appreciated that the embodiments of the 20 present invention hereinbefore described are given by way of example only, and are not meant to limit the scope of the invention in any way.

It will also be appreciated that the disclosed embodiments are, in use, likely to have a fluid flow rate

of around 5 to 40 litres per minute (1-8 gallons per minute) and be capable of cleaning 5 to 40 litres of liquid (oil/fat) in around 2 to 30 minutes.

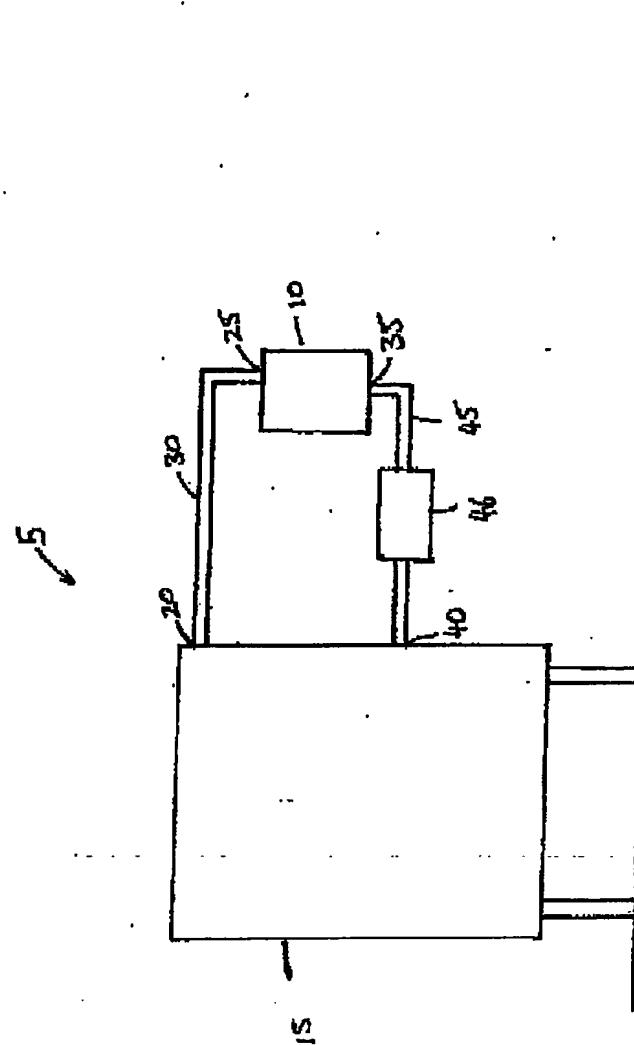


Fig 1

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Fig. 2

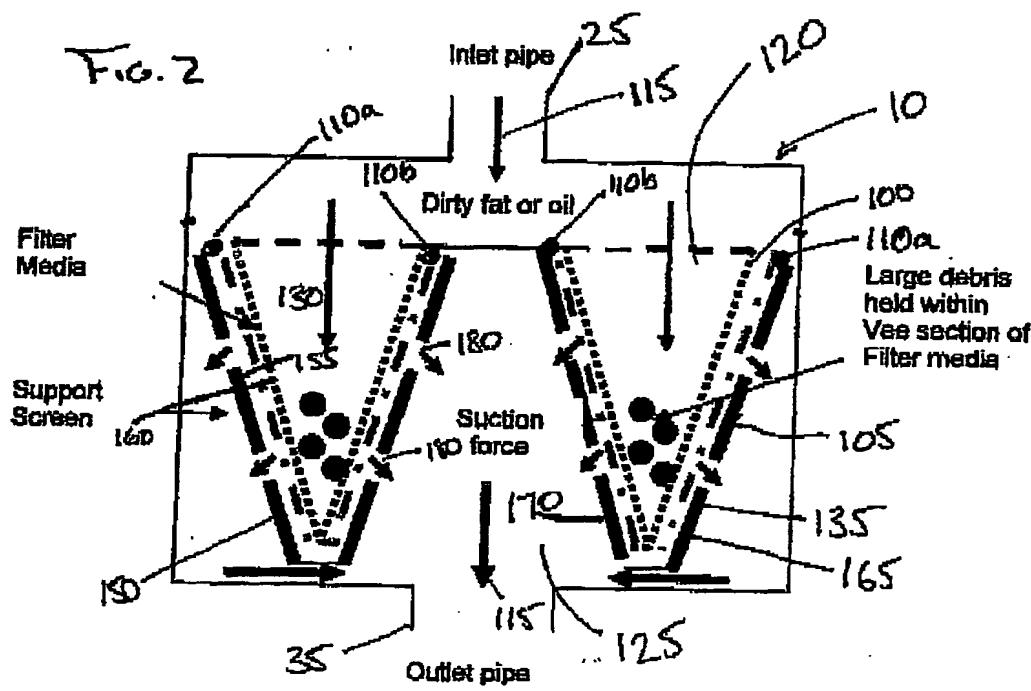
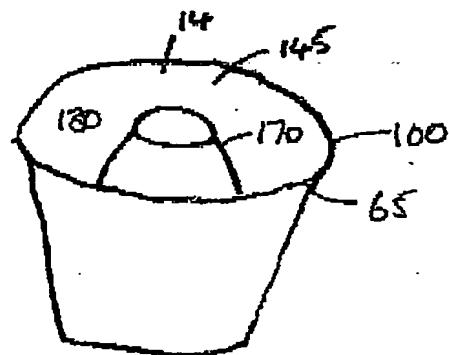
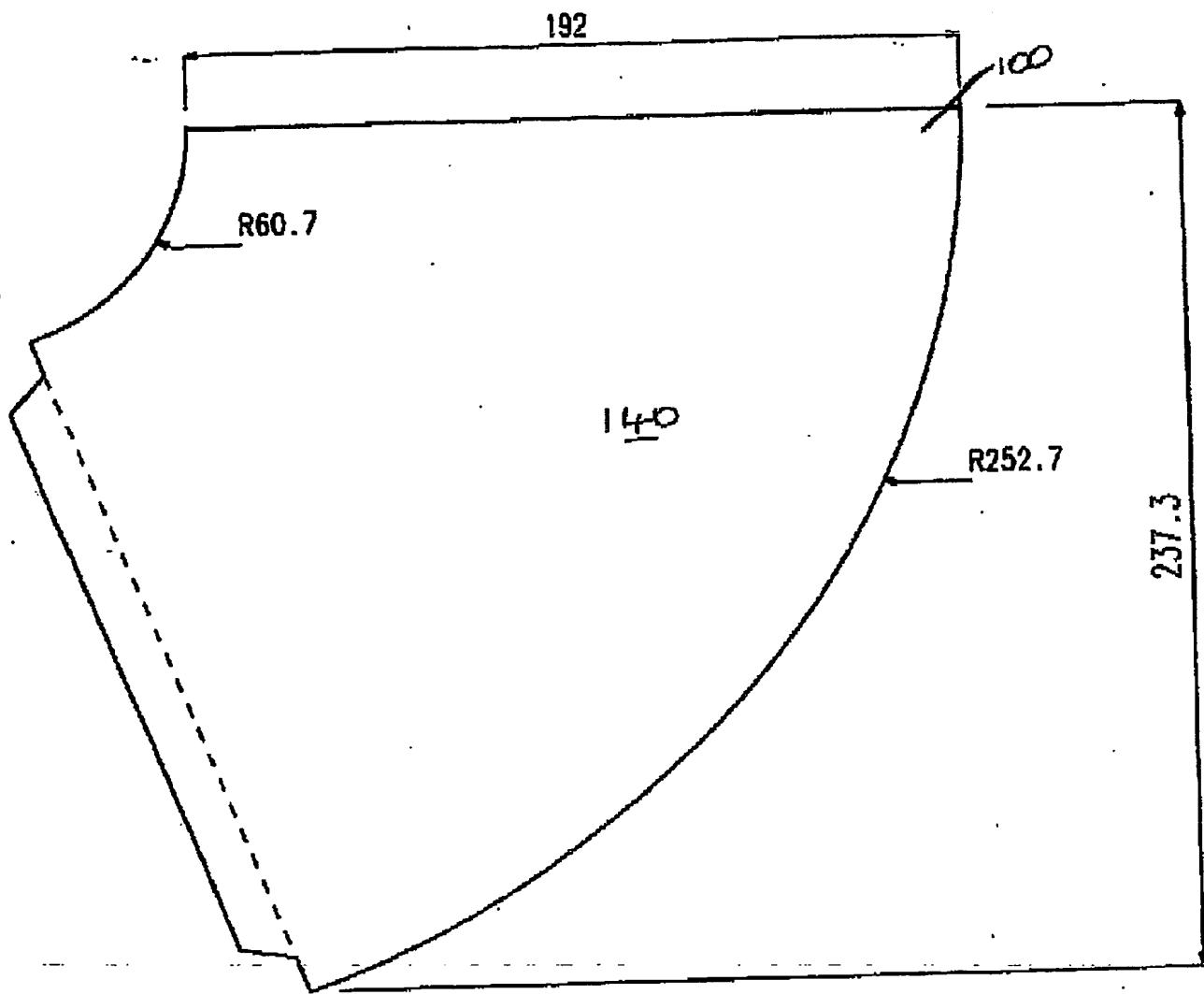


Fig. 3



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Fig. 4



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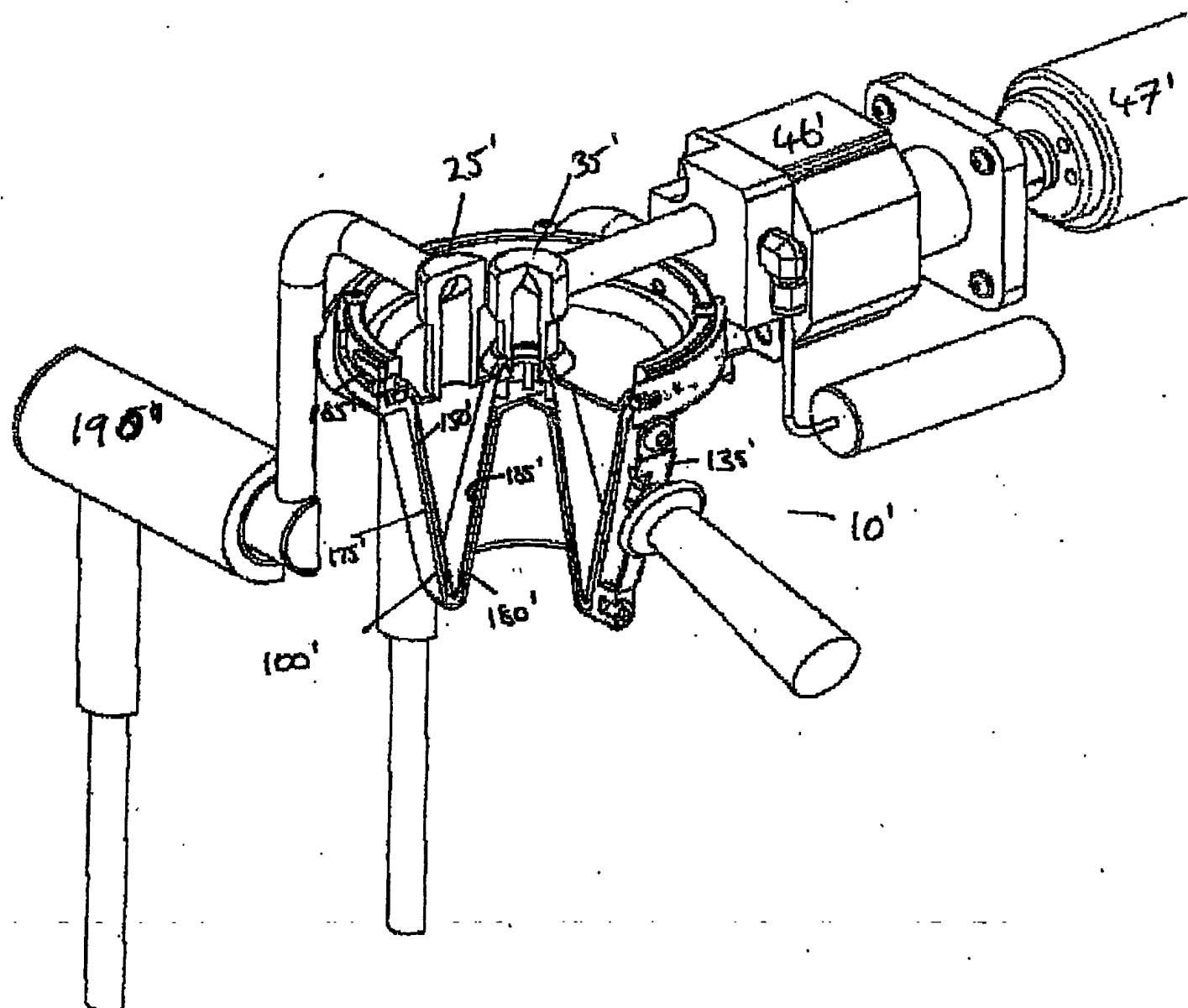


FIG 5

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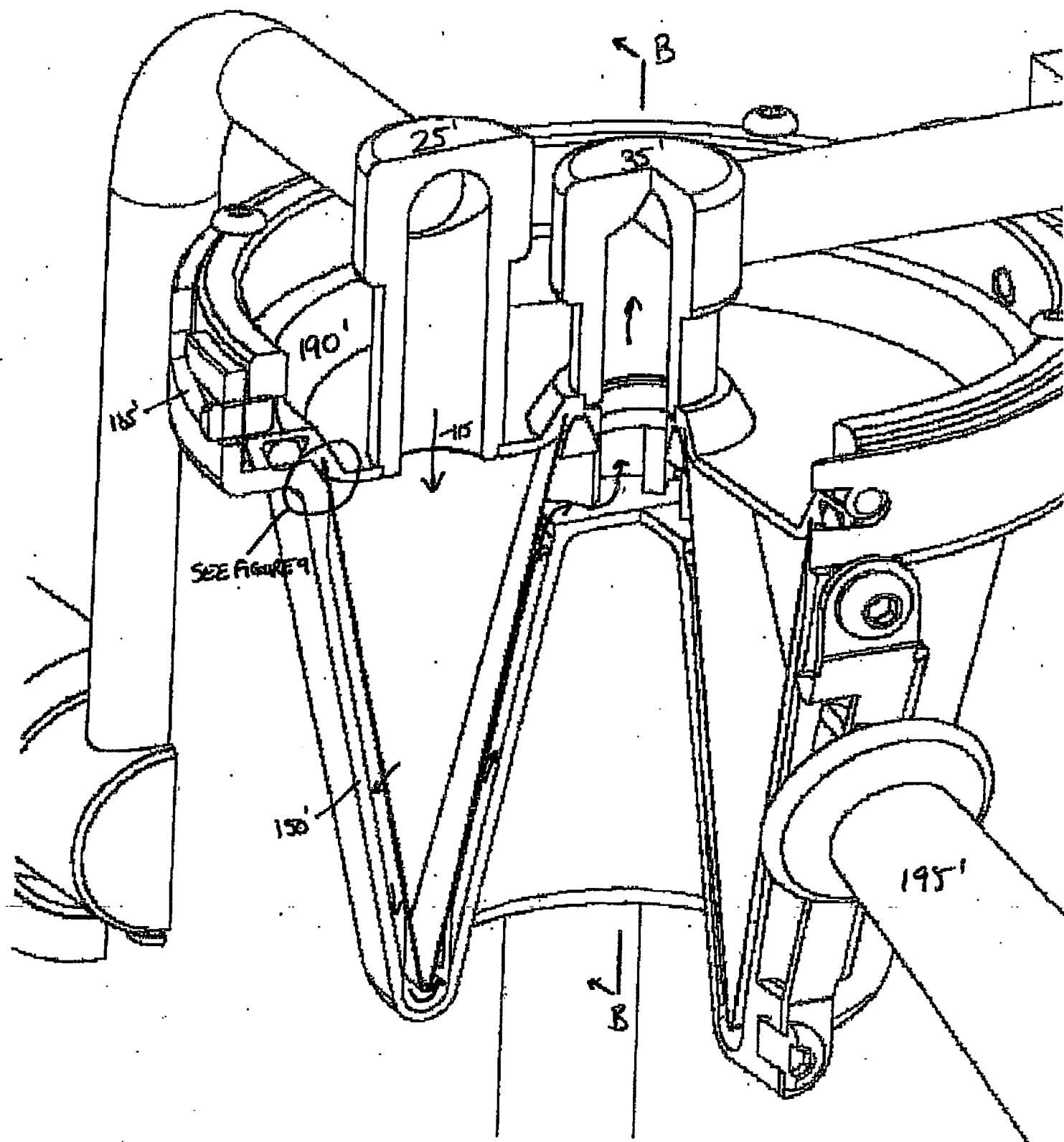


FIG 6

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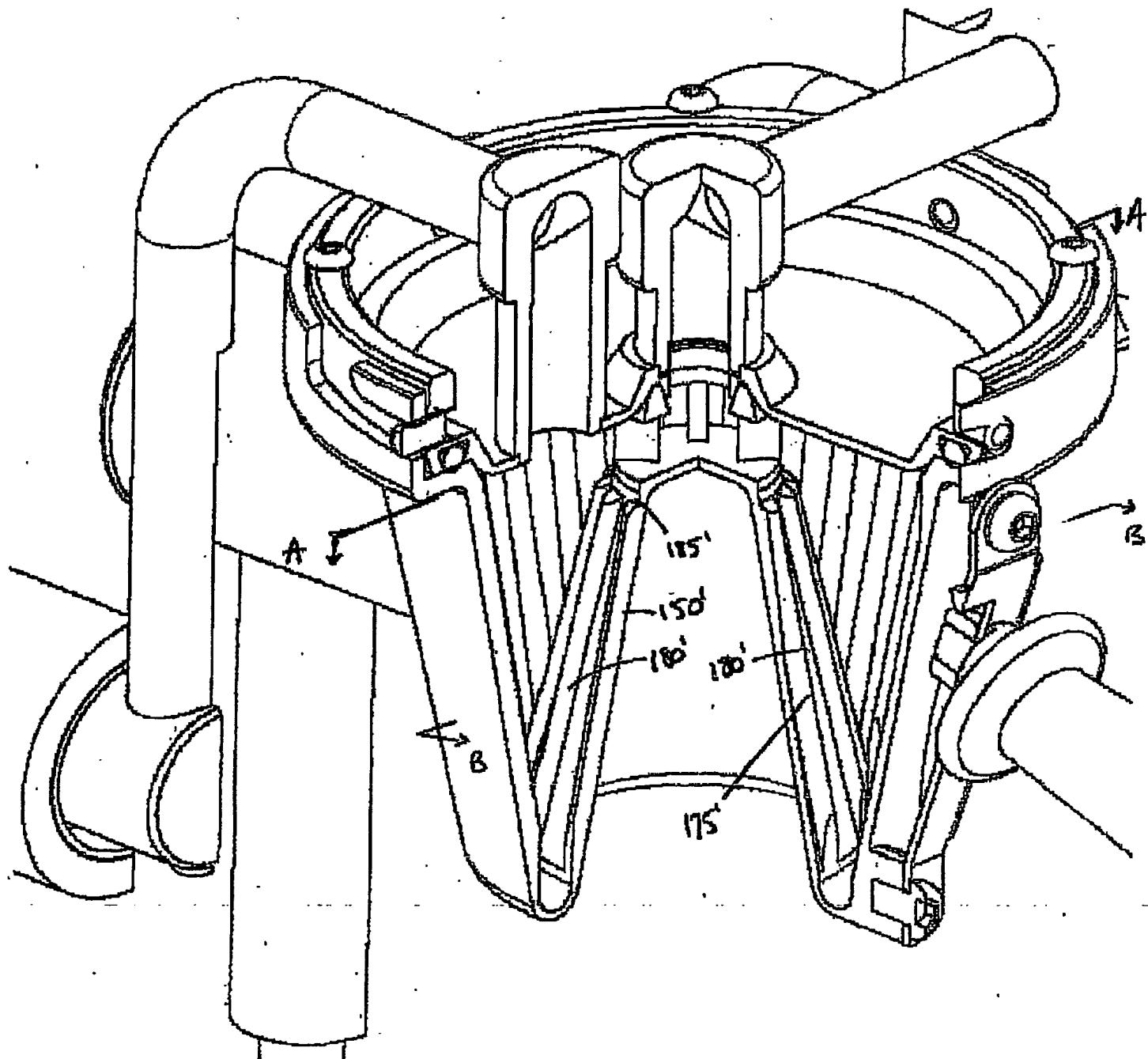


Fig 7(a)

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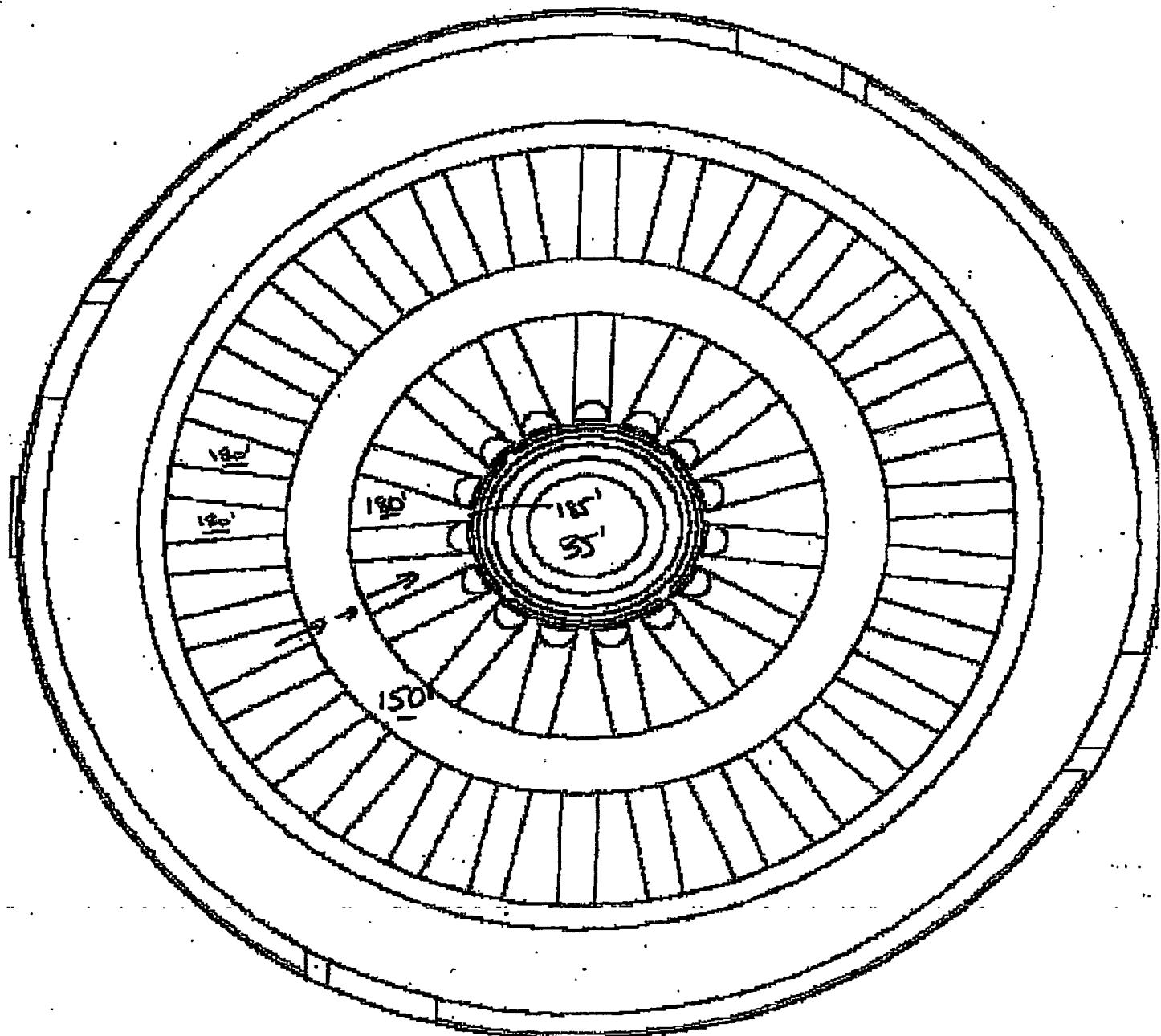


Fig 7(b)

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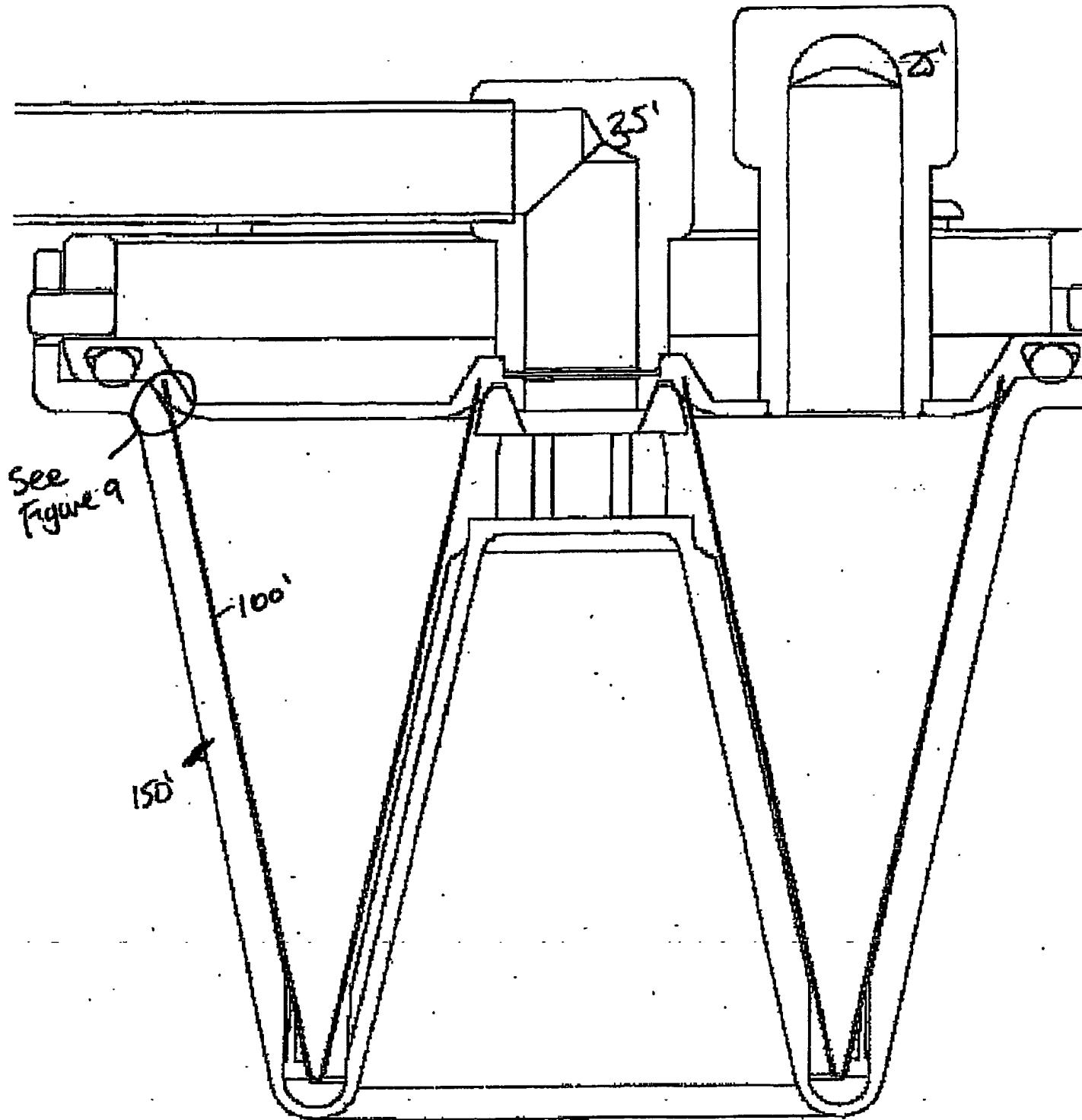
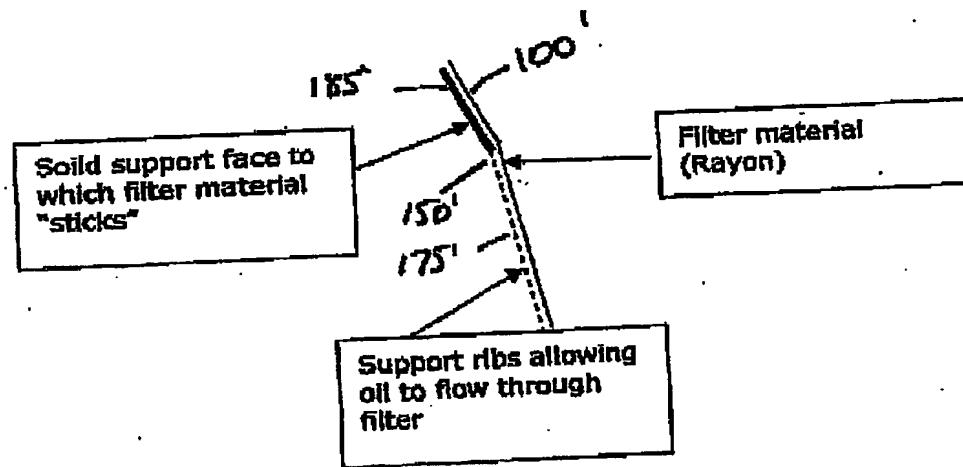


Fig 8

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FIG. 9



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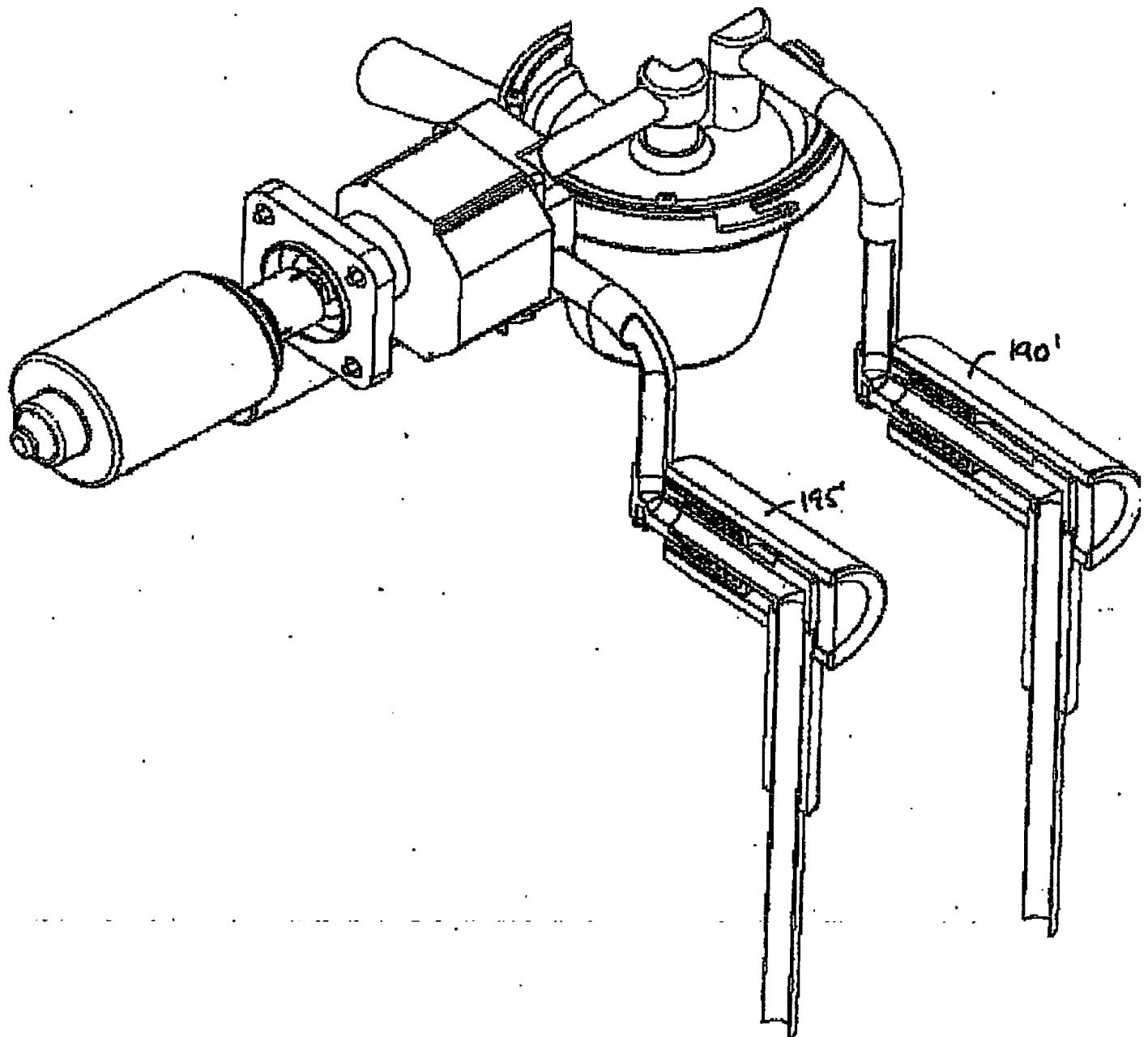


Fig 10

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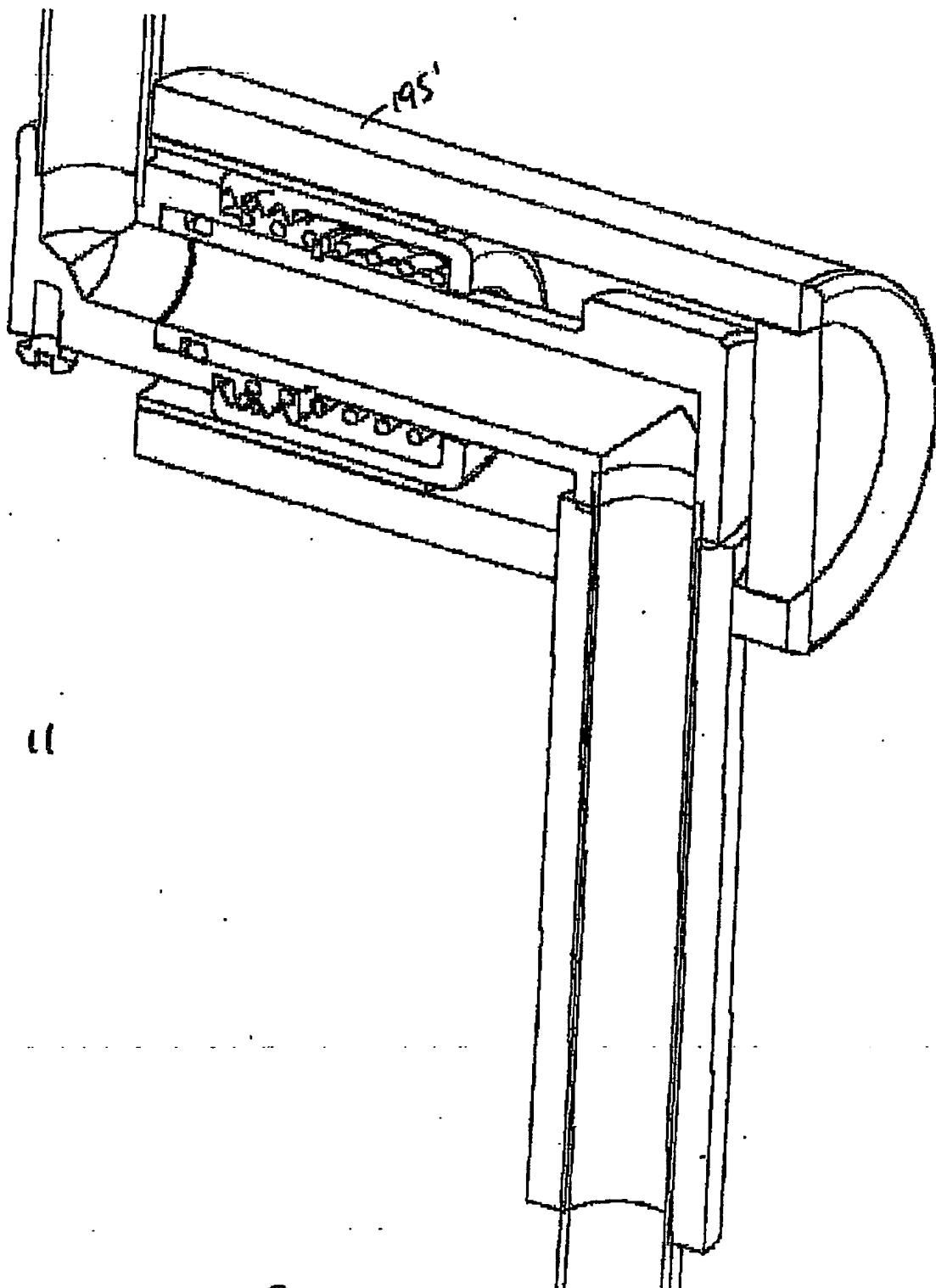


Fig 11

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